AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 (original). Magnetic gradient field projection apparatus for generating a magnetic field along a projection axis, in a defined sample volume offset from and outside said apparatus, comprising gradient field generating means arranged to generate a substantially linear axial gradient component in said sample volume, said gradient field generating means comprising a substantially circular coil positioned so that the centre of the coil is displaced along the axis of the coil away from the centre of the sample volume by a distance approximately equal to half of the radius r_1 of the coil, such that the second derivative of the axial gradient component is substantially equal to zero at the centre of the sample volume.

2 (original). Apparatus according to claim 1 comprising a further coil, the axis of the further coil being substantially coincident with the axis of said coil, and distance of said further coil from the centre of the sample volume, and the radius of the further coil, being selected such the angle subtended at the centre of the sample volume by each of said coils is substantially the same.

3 (original). Apparatus according to Claim 2, the distance of said further coil from the centre of the sample volume being substantially equal to half of the radius r_2 of the further coil, the coils being connected so that, in use, the relation

$$\left(\frac{r_2}{r_1}\right)^4 = -\frac{I_2 N_2}{I_1 N_1}$$

is substantially satisfied where I_1 and I_2 are the currents flowing through said coil and said further coil respectively, and N_1 and N_2 are the numbers of turns of said coil and said further coil respectively, the radii of the coils being mutually different, the currents in the coils flowing in opposite directions.

4 (currently amended). Apparatus according to ~~any preceding claim~~ claim 1 comprising a plurality of substantially circular coils of differing radii arranged in substantially parallel planes with their centres passing through a common axis, the distance of each coil from the centre of the sample volume, and the radius of each coil, being selected such the angle subtended at the centre of the sample volume by each of said coils is substantially the same.

5 (original). Magnetic gradient field projection apparatus for generating a magnetic field along a projection axis, in a defined sample volume offset from and outside said apparatus, comprising gradient field-generating means arranged to generate, in use, a transverse gradient component of said magnetic field which is substantially linear within said defined sample volume, said gradient field-generating means comprising two substantially parallel long substantially straight conductors substantially symmetrically located about an axis passing through the centre of the sample volume, said conductors lying in a plane substantially perpendicular to the

projection axis and offset along said projection axis from the centre of the sample volume, wherein the conductors are arranged to carry substantially equal currents in a common direction and are positioned relative to the centre of the sample volume such that the second derivative of the transverse gradient component in the transverse direction is substantially equal to zero at the centre of the sample volume.

6 (original). Apparatus according to Claim 5, wherein the spacing a_1 between the conductors and the distance d_1 of the plane through the conductors from the centre of the sample volume, substantially satisfy the relation $a_1^2 = 4d_1^2 (3+/-2\sqrt{2})$.

7 (original). Apparatus according to Claim 6, wherein a further pair of substantially parallel conductors is provided, the plane of the further pair being substantially parallel to the plane of said pair of conductors, the current in the further pair arranged to flow in the opposite direction to the current in said pair of wires, the distance of the further pair being greater than the distance of said pair of wires, the separation a_2 of the further pair of conductors or wire bundles and the distance d_2 of the further pair of conductors or wire bundles from the sample plane substantially satisfying the relation $a_2^2 = 4d_2^2(3+/-2\sqrt{2})$, the currents in the conductors or wire bundles further substantially satisfying the relation $\Sigma I_2/\Sigma I_1 = -(a_2/a_1)^3$, where ΣI_1, ΣI_2 are the total currents in each conductor for the first and second pairs respectively.

8 (original). Apparatus according to Claim 6, wherein a further pair of substantially parallel conductors is provided, the plane of the further pair being

substantially parallel to the plane of said pair of conductors, the current in the further pair arranged to flow in the opposite direction to the current in said pair of wires, the distance of the further pair being greater than the distance of said pair of wires, the separation a_2 of the further pair of conductors or wire bundles and the distance d_2 of the further pair of conductors or wire bundles from the sample plane substantially satisfying the relation $a_2^2 = 4d_2^2(3 \div /-2\sqrt{2})$, the currents in the conductors or wire bundles further substantially satisfying the relation $\Sigma I_2/\Sigma I_1 = -(a_2/a_1)^6$, where $\Sigma I_1, \Sigma I_2$ are the total currents in each conductor for the first and second pairs respectively.

9 (original) A magnetic field projection apparatus comprising a plurality of gradient field generating elements arranged to generate substantially linear magnetic gradient field components in mutually orthogonal directions in a sample volume offset from and outside said apparatus, wherein said magnetic field generating elements comprise

an axial gradient component generating element comprising a substantially circular coil positioned so that the centre of the coil is displaced along the axis of the coil away from the centre of the sample volume by a distance approximately equal to half of the radius r_1 of the coil, such that the second derivative of the axial gradient component is substantially equal to zero at the centre of the sample volume, and;

a transverse gradient component generating element, comprising two substantially parallel long substantially straight conductors substantially symmetrically located about an axis passing through the centre of the sample volume, said conductors lying in a plane substantially perpendicular to the projection axis and offset along said

projection axis from the centre of the sample volume, wherein the conductors are arranged to carry substantially equal currents in a common direction and are positioned relative to the centre of the sample volume such that the second derivative of the transverse gradient component in the transverse direction is substantially equal to zero at the centre of the sample volume.

10 (currently amended). Apparatus according to ~~any of the previous claims~~ claim 1 further including

A housing;

Means for defining a sample volume outside the housing;

A magnet assembly within the housing for generating a static magnetic field within the defined sample volume along the projection axis;

a radio frequency transceiver within the housing for transmitting signals to and receiving signals from the defined sample volume;

control apparatus for controlling said magnetic field generating elements to generate said at least one gradient component in conformity with an imaging protocol.

11 (original). Apparatus according to Claim 10, wherein said means for defining the sample volume comprises an operating surface to the outside of said housing over which a sample to be imaged, preferably a patient, can be positioned.

12 (currently amended). Apparatus according to ~~any preceding claim~~claim 1, further comprising means for applying current to generate desired gradient components

in accordance with a given imaging protocol.

13 (currently amended). Magnetic resonance spectroscopy system comprising an apparatus according to ~~any of claims 1 to 10~~claim 1.

14 (currently amended). A method of configuring a magnetic gradient field projection apparatus according to ~~any of the previous claims~~ claim 1 to produce a substantially linear magnetic field gradient component within the defined sample volume, comprising positioning the gradient field generating means with respect to the sample volume so that the second derivative of a desired component of the magnetic field with respect to distance along a predetermined direction corresponding to said magnetic field gradient component is substantially equal to zero at least about a predetermined joint within the defined sample volume, preferably at or adjacent the centre of the sample volume.

15 (original). A method according to Claim 14, further comprising arranging the assembly so that the third derivative of said component of the magnetic field with respect to distance along said predetermined direction is substantially equal to zero at least about said predetermined point within the defined sample volume.